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THE MANUAL ARTS

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THE MANUAL ARTS

BY

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PREFACE

THE greatest present problems affecting the manual arts in education, whether that education be vocational or cultural in its aim, are centered around the selection and organization of subject-matter and methods of teaching. Believing this to be true, the author contributes the following chapters to the discussion of these problems, hoping that they may be of some service to his fellow workers.

Several of the chapters have previously appeared as articles in magazines. When brought together, however, they have a significance which they did not possess as isolated articles appearing from time to time over a period of several years.

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CHAS. A. BENNETT.

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CHAPTER I.

Which of the Manual Arts shall be Taught in the Schools?

OUR forefathers came to this country civilized and equipped for the tasks before them. They came with habits of worship and reverence, with ideals of liberty and with knowledge of legal procedure. They came also with manual efficiency; some were farmers; others were carpenters, masons, millers, wheelwrights and blacksmiths; the women could spin and weave, sew and cook, clean and manage a household. When schools were established, these were to train men to become lawyers, statesmen and preachers of the gospel. Schools for the manual industries were not needed because everybody worked with his hands, and the theories, recipes and traditions of the crafts were handed down from father to son, or from master to apprentice. The common schools taught all children to read and write because such instruction was considered a necessary safeguard to the democratic form of government which was adopted. Ability to cipher, also, was considered desirable for all, and in the villages and towns it soon became essential because it had to do with money and the sale of merchandise.

Decades came and went and left pioneers still subduing the forest lands and exterminating the Indians. Generations passed; cities began to spring up and grow; the prairie lands of the Central States began to yield an abundant harvest and the mines to give up their rich stores. Manual labor, joined with natural resources, yielded great wealth. But during all this time the school was not called upon to train in manual industry. The school had, however, greatly increased its facilities for training for citizenship and the professions; academies, colleges and professional schools had been established and were rapidly growing into great universities; and the common schools had been multiplied to keep pace with the expanding frontier.

Then came the demand for men trained in science and engineering to build railroads and bridges, canals and aqueducts, engines, ships and machinery of all kinds. This practical demand led to the establishment of schools of science and engineering, and soon the science studies found their way into the curriculum of the common schools. The growth and struggles of the nation demanded a more broadly educated citizenship, and historical studies and the study of social problems also found a place in school work.

While all this remarkable development has been going on in the national life and in the school, the

mode of living has changed as rapidly. The simple life of the earlier days has given way to the many complexities of our present life. Now we all want modern houses; we want them individual in design, finished in hard woods, heated by automatically regulated furnaces, supplied with an abundance of water, gas, electricity, and telephones connecting us with our neighbors and friends. We want artistic draperies, rugs and wall coverings, good furniture, fine pictures, statuary and musical instruments. If we compare our present homes with the homes of our grandfathers when we were children, we realize what a rapid and remarkable change has taken place. About the same change has taken place in reference to our food and clothing. Instead of contenting ourselves with what can be raised in our own garden or our own town, we get food from the most distant parts of the earth, and by rapid transportation we have largely overcome the limitations of season. We no longer spin and weave in our own homes; knitting by hand is almost a lost art, and most of the sewing is done "on the machine." When we turn from the home to business the same is true. The farmer who is not equipped with motive power and machinery, can hardly expect to compete in the market. The ox team has given way to the traction engine, the cradle to the self-binding reaper, and so on thru the list. This is equally true in manufacturing and nearly every other line of business.

Things are being done at greater speed and in a manner that requires a more elaborate equipment.

All this development has immensely increased the output demanded of the producing and distributing industries. This demand in turn has increased the need for skilled workmen. Another factor that has acted with this need is the internal development in the industries themselves, which has come in part from the necessity of a more economical use of materials, but principally from the discoveries of science and their application to industry. If one tries to enumerate the changes in the metal industries alone that have followed the application of electricity in the telegraph, the telephone, the electric light, and electric motors he soon sees how endless is the undertaking. A very important result of this development in the industries is the need of men with a wider knowledge of the materials and processes of industry and the principles upon which the processes and the use of the materials rest. This knowledge is not being handed down from father to son to any great extent, nor from master to apprentice, partly because the factory system does not easily lend itself to education, and partly because the knowledge needed is so new that even the masters themselves find it difficult to keep up with the development. But this need for a wider knowledge of the principles and processes of industry is not confined to the workers in these producing industries. Every

man who would intelligently use the modern conveniences of his own home, or the labor-saving devices and conveniences of business life, must know something of the materials and principles of industry; and if he is to have any adequate appreciation of the product—if he is to judge the quality of the thing he purchases or uses, he must know something of the process that produced it. In fact, industrial development has been so rapid and so varied in our country—it has affected every man's life to such an extent that if he is to retain sufficient mastery of his environment to make it serve his needs, he is forced to acquire considerable practical knowledge of the materials, principles and processes of industry. As we have already seen, this knowledge is not being handed down from parent to child in any adequate way, and so we look to the school to furnish it. And if the school is to furnish it, the school must be equipped with the tools of industry.

Having accepted the responsibility for giving instruction in the industries, the school finds itself facing a long series of problems of selection, organization and administration. Most of these problems are still unsolved, tho many of them are being solved.

Perhaps the problem of first importance relates to the selection of subject-matter. Which of the many manual arts shall be taught? Are some more fundamental than others? How can the

manual arts be classified? What shall be the basis of our choice between them? These questions are consciously or unconsciously being answered for individual schools, but too often without a sufficiently broad view of the needs and the possibilities. To find adequate answers one must survey the whole field of the manual arts as applied to industry; he must search out a basis for classification; then he must select fundamental processes in each class. Perhaps no better classification has been suggested than the following:

(*a*) the graphic arts.
(*b*) the mechanic arts.
(*c*) the plastic arts.
(*d*) the textile arts.
(*e*) the book-making arts.

These five should be found in every course in the manual arts which extends thru the elementary school period, and if cooking is more art than science, the culinary arts should form a sixth class.

The graphic arts were the first to be given a place in school work. These include all forms of drawing, both freehand and mechanical. The industries they represent are numerous—architectural and machine drafting, all forms of engineering drawing, designing for a variety of industries, and illustrating for newspapers, magazines and books. The increasing importance of these arts is apparent to everyone who gives the matter

thought, and the more one gives it thought, the more firmly convinced does he become that there is great need of revising many of our school courses in drawing so that they will be in harmony with the needs of the industries. Courses may be made far more practical than they are at the present time without being less cultural, and the more they harmonize with the best industrial practice in these arts, the more highly will they be valued by the community. Too often the drawing work has been a blind struggle for self-expression, when good representation would have been far better. Drawing is a language, and as such, a considerable knowledge of its symbols and forms must precede effective expression, especially in grades above the primary school. The fact that the graphic arts do serve as a language, transmitting thought concerning form and relative size, direction and curvature, tone and color, gives them a unique and important place in their relation to the other manual arts. For this reason, then, the graphic arts are fundamental, and rightly deserve first place in any course of instruction in the manual arts.

But just as power to write good English is of comparatively little value without thoughts to express, so the graphic arts are robbed of half their value if not accompanied by some of the other manual arts. Mechanical drawing, for example, becomes too theoretical and often almost useless when not accompanied by woodworking

and metalworking. Design, as we have been told so many times during the past few years, and are now just coming to believe, can be taught at its best only when associated with work in the material into which the design is to be wrought. The use of the object suggests the form; this is modified by the materials; both form and materials, together with the tools, limit the design, and often suggest it. If necessary, other examples could be given to show the dependence of the graphic arts upon the constructive arts. Without the graphic arts the constructive arts have no means of communication, no language; they are dumb. Without the constructive arts the graphic arts are lacking in content, in thought, in application. The interdependence is thus apparent.

Of these constructive arts the mechanic arts have been most prominent in the minds of advocates of manual training. This is chiefly due to the fact that they deal especially with the two great constructive materials of our civilization—wood and metal. Not only the building and machine industries, but most manufacturing and engineering enterprises—ships, railways, private vehicles, home furnishings and conveniences depend upon the skillful use of these two materials. The mechanic arts therefore appropriately head the list of constructive arts.

In marked contrast with the mechanic arts, yet in many ways associated with them, are the plastic

arts. These include brick and tile making, concrete construction, pottery, terra cotta and modeling. These arts at present find their best school counterpart in clay-work. Year by year the industries involving the plastic arts are becoming more and more important. The exploitation of our forests is making recourse to the clay bank a necessity in building. Demonstration of the possibilities of reinforced concrete construction is placing sand and cement in competition with steel. As the cities grow in size calling for more large buildings, the demand for ornamental tiles and terra cotta increases, and under similar circumstances there is an increased demand upon the plastic arts for the decoration of the interiors of buildings. From the standpoint of industry, then, the plastic arts constitute an important division of the manual arts, and from the school standpoint clay-work is one of the very best means of training; it is form study work *par excellence*.

The fourth group of arts is the textile arts. This includes spinning, weaving, braiding, dyeing, basketry, knitting, sewing, embroidery, garment making—a large number of processes fundamental in our civilization. No further discussion of these is necessary; their vital importance is apparent.

The fifth group consists of the book-making arts —printing, engraving, lettering, leather tooling, bookbinding and construction work with paper, cardboard and paste. While these arts are not

as fundamental to man's existence as the fourth group, which provides his clothing, and the second and third, which provide his shelter, they do provide his chief means of storing up thought and transmitting it from one man to another and from generation to generation. This group of arts, then, is essential to progress if not to existence, and to that extent it is fundamental. From the school standpoint this group is one of especial value because it relates so readily to other school work; many of its processes are simple, requiring but little equipment and only such materials as are readily obtainable.

To these five may be added the culinary arts; yet for some reasons the preparation of foods is more fittingly classified among the sciences than among the arts. Undoubtedly it is both a science and an art, and whether it is more one than the other is of no importance here. The essential point is that food-work is fundamental to civilization, and should have a place among the other manual arts in the school.

No school system should be satisfied with teaching only one or two of the manual arts; some practical experience in all of them is necessary to prepare for the enjoyment of modern home and industrial conditions, and essential to an adequate appreciation of the arts of modern life.

The public school has a noble record and should not be diverted from its traditional purpose, which

manifestly is to round out preparation for living, not in the remote or the near past, but to-day, in modern surroundings. Thomas Davidson has said that education "has grown with the growth of practical intelligence, and has been in all cases a preparation for life under existing institutions." It is the schoolman's duty to analyze present conditions, determining what constitutes a preparation for adequate living, and then shape the work of his school accordingly.

CHAPTER II.

The Place of the Manual Arts in Education.

AS the field of school education broadens, its aims and methods become more varied and complex, and often confused. This is certainly the case today in that department of education which deals with the manual arts. The motives for the introduction of these arts have come to be so varied that to think clearly concerning this phase of school work is very difficult. This is perhaps fundamentally due to changing social ideals and consequent demands, but it is partly due to a failure of educators to recognize that the manual arts function in school education both in attaining the end of education and in facilitating the educative process. The teacher needs to keep in mind this dual capacity which the manual arts possess as a means in education.

This duality of function is not peculiar to the manual arts. It is equally true of the natural sciences, and many have been the pedagogical battles fought out in that field in times past. One can readily recall the time when the science teachers were dwelling in two camps, one emphasizing the facts of science and the other the method. It

would seem, therefore, that the arts might have profited by the experience of the sciences, but in much of the discussion during the past fifteen years, this surely has not been the case and is not today. One man looks upon the manual arts as a body of subject-matter to be taught as he would teach the facts of history; another insists that the manual arts must be regarded as a fundamental method of education, and claims to care little or nothing for the subject-matter involved in this method. The place, therefore, of the manual arts in the one case is quite different from that in the other. One leads chiefly to a mastery of the materials and the manual processes of industry, the other to a new motive and means of expression in teaching other subjects. The man whose vision penetrates deep enough sees that the big truth concerning the manual arts includes both of these, and that instead of being in conflict, they are really in harmony. When this viewpoint has been gained, a most fundamental step has been taken toward finding the place of the manual arts in education.

In discussing this larger view, four propositions may be considered:

1. In so far as the *end in education* can be attained more readily through the employment of the manual arts, these arts should have a place in education.

The end of education changes from age to age as civilization advances, and should be in harmony

with the ideals and institutions of the time. At the present time no end seems so much in harmony with needs and the highest ideals as that of social efficiency in the individual. In its broad interpretation, this term seems to summarize all other worthy aims, and points toward a goal not yet reached. Taking for granted, then, that the ultimate end of education is social efficiency in the individual, the manual arts should have a place in school education corresponding to their effectiveness in helping men to become socially efficient.

As social efficiency in the individual means first of all that each individual must be directly or indirectly a productive member of society, the arts must answer the demand of productivity. To be productive a man must at least "pull his own weight." He may do so either "directly as a productive agent, or indirectly by guiding, inspiring, or educating others to productive effort."[1]

As productivity in the great majority of individuals is the direct result of the intelligent and skillful use of the hands, it follows that training in the manual arts, which more than any other division of school work develops such use of the hands, should be given a place sufficiently large to allow such training to be effective. Until sufficient time is allowed in the school program for manual arts, no one should expect large results from them. With a time allowance which will require as much

[1]Bagley: *The Educative Process.*

of the pupil's effort as is given to the other fundamental studies, both inside and outside the school, the manual arts will yield results which count large on the side of productivity.

The manual arts contribute to social efficiency in several ways. They not only give vocational power, contributing largely to ability to earn a livelihood, but they impart first-hand knowledge of the material accessories of modern life. Every man's effectiveness and happiness is dependent in some measure—sometimes in large measure—upon the ease and intelligence with which he utilizes the modern conveniences in his own home or the material devices which make for economy and efficiency in business life. Moreover, the manual arts develop appreciation of beauty in its relation to material form, color, tone, and texture, which is an element not only in esthetic enjoyment but in general efficiency and productivity. And, further, the manual arts provide a means in addition to written language, of transmitting from generation to generation and age to age, some of the choicest thoughts and feelings of man. Since the manual arts contribute so largely to social efficiency, and social efficiency is the end sought in education, the manual arts deserve a place in school work.

2. In so far as the *educative process* can be accelerated and made more thoro thru the employment of the manual arts, these arts should have a place in education.

The educative process is one of gaining experience either directly, or indirectly, thru other persons or their records in books or works. In this process of gaining experience, the value and effectiveness of indirect experience is dependent to a very large extent upon related direct experience. There is no substitute for such of these direct experiences as are fundamental, and the greater the number, the greater will be "the mass of apperceiving ideas," tho after some fundamental direct experiences have been gained, it is often economy to make use of indirect experiences. To gain the fundamental direct experience at the time when needed and in the right relation to associated indirect experience is most desirable. To bring this about is largely the work of the school, and therefore the school must have the necessary means at hand.

Applied to the manual arts, this indicates that if these arts are to be effectively taught in the school, or if real appreciation of these arts is to be developed, first-hand experience must be gained in them in the school. It is folly to try to teach a girl to appreciate needlework without giving her needle and thread and cloth and teaching her to sew, but after she has learned the fundamentals of sewing this knowledge will serve as a basis for the appreciation of results in needlework quite beyond her skill to produce, and wholly beyond her ability to appreciate before she had learned

the fundamentals of needlecraft. Moreover, many of the other subjects of the school curriculum—certainly of the elementary school—are naturally so interwoven in the manual arts and find practical application so widely thru them, that direct experience in these arts provides a motive, a need, recognizable by the child, which is at the basis of many of our modern methods of teaching. A child wants to make a picture book. In making it he must measure and he must divide; he should also increase his practical vocabulary; in addition to these he may learn something of the early history of books and of the source of paper and strawboard and cloth and paste; he may then collect pictures and learn something of the lives of the men who painted them and the thoughts and feelings they desired to express thru them. Thus the manual arts serve as a method or means of teaching other subjects, and so contribute an element of value in the educative process.

3. If the place of the manual arts in education depends upon their service in attaining the end of education and their value in the educative process, then they should be regarded as both subject and method.

The history of handwork in education reveals two traceable tendencies concerning the place of the manual arts which have been more or less in conflict. One has been to regard these arts as a subject and the other as a method.

Dr. Pabst of Leipsic has pointed out[1] that Heusinger believed that the impulse to activity should be used to lead man to avenues of knowledge which otherwise would remain closed to him. Froebel emphasized and developed this idea and placed handwork at the very center of the curriculum. Herbart, on the contrary, and many of his followers, use handwork as a means of teaching the other school subjects, and make handwork dependent upon the other branches of instruction for its problems. Salomon in Sweden, Goetze in Germany, and most of the early leaders of manual training in England and in this country regarded their work as a subject co-ordinate with other subjects in the curriculum, while Colonel Parker and several child-study specialists in this country and in England have given marked emphasis to handwork as a method in education; and much of the literature of the subject of a few years ago was written from the viewpoint of these men. During the past few years, with the advent of the movement toward industrial education, there has been a growing tendency again to give emphasis to the manual arts because of their content value, but, let it be hoped, without forgetting their process value.

Today it seems clear that the manual arts in education should function both as subject and

[1] *Handwork Instruction for Boys*, translated by Bertha Reed Coffman.

method. The advocate of either view by itself seems not to present the whole truth. To contend that in order to have educative value, work in the manual arts must smack of a trade, or to look upon these arts in the school as merely producing certain specified material forms in clay or wood or metal, without reference to how they are produced; or again, to think of the manual arts as merely a body of facts to be learned about materials, tools, forms, colors, and processes, is to fail to get an adequate idea of the place of the manual arts in education. On the other hand, to insist, as some have done, that the function of the manual arts is to provide a concrete method of teaching other school subjects, or to supply a motive or need which will admit of a better method of teaching the other subjects, is to reveal an equally inadequate conception of the function of the manual arts in education. Only thru the unification of these two views of the manual arts, regarding them as possessing at once the characteristics of both subject and method, can we hope to get the true and adequate conception which will be a safe guide in organizing manual arts work in the school.

4. Considering the place of the manual arts in education as dependent upon the aim of education and the needs of the educative process, and regarding these arts as both subject and method, the place which they should occupy in the work of any sec-

tion of the school, as primary, grammar, or high, can be determined by discovering the specific end sought in that section and the special needs of the educative process with reference to the manual arts in the particular stage of child development represented by the section.

In considering the primary grades it may be assumed that it is clear to every one that so far as the manual arts are concerned, the end of social efficiency in the individual is better served by laying a broad foundation of first-hand experience than by taking him thru any narrow course of more specific technical training. It has been proven that if sufficient time be given to basketry for several years, American primary school children can make most remarkable baskets, some of them almost rivaling the work of the aborigines themselves in fineness and technic. But it is hardly the function of the primary school to train expert basket makers, and it would be difficult, on any other ground, to justify such a narrow course of training in handwork. It would be far better to give the young child experience in a large variety of materials and processes, not so much to teach technic as to stimulate and guide his natural constructive activity, and to utilize the great opportunity that presents itself at this age for expression, more or less free, thru concrete material. In fact, in these grades the manual arts should be regarded as a method far more than a subject.

Let them serve every other subject or embryo-subject in every natural and reasonable way. Instead of limiting the child in this work to paper and raffia, or clay and cloth, or wood and wire, give him all of these and more. Cultivate in him the habit of observing how things are made, of expressing ideas in concrete form, of constructing well enough to serve a purpose which he understands, and of doing it all so neatly and in such good form and color that it is pleasing to his gradually more discriminating eye. Stimulate in him that real joy and wonder at the possibilities of construction with his own hands, which the little kindergarten boy felt when in great enthusiasm he said, "Isn't it fine to see how one thing busts into another without breaking." The aim, then, in the primary grades should be to utilize the manual arts in giving the child an opportunity to gain a wide range of direct and useful experience with constructive materials and processes, without very much reference to technic.

In the early grammar grades the emphasis begins to shift toward the manual arts as a subject, and in the upper grammar grades, technic is as essential as was freedom from technic in the lower primary grades. Physically and mentally the child is now ready to form very definite habits in the use of his hands. In fact, he will form them whether we wish him to or not, and it is therefore essential that we see that the right ones instead

of the wrong ones are formed. If he uses a tool, he should be taught to use it in the right way. Otherwise he may have to go thru the expensive process of inhibiting a bad habit and acquiring a good one in its place. When such bad habits are multiplied they become discouraging and well-nigh impossible to unlearn; hence the justice of the criticism of some work for pupils of this age that has passed under the name of manual training, but fails to possess the first fundamentals of real manual training.

This emphasis on technic does not lessen the interest of the child in his work; on the contrary, it deepens it and renders it more permanent. Moreover, emphasis on technic does not mean returning to the rigid systems of models imported many years ago from Europe; neither does it mean adopting the factory system in all our grammar schools. It does mean *thoroness* where too often there is lack of it, and it does mean teaching a technical process in harmony with recognized technical standards.

All this does not interfere with the manual arts in these grades being of value as a method in teaching other subjects, but it does mean that the work during this period contributes to social efficiency, the end of education, more distinctly and definitely than it does to the educative process. A lack of clearness of conception concerning this point has caused much confusion among teachers.

The present demand for industrial education, if rightly interpreted and conservatively heeded, may bring us to our pedagogical senses in this matter. If all our art and manual training work of the upper grammar grades were more thoroly done, more technical in character, more in harmony with the industries of adults—were more definitely a serious subject—and if it were given sufficient time in the school program to become really effective, we would hear less complaint about the defects of the school system.

Sufficient time is essential. What could an eighth grade teacher do in teaching United States history if her pupils spent no time outside of the recitation period in the preparation of their lesson and were to recite but once a week—thirty-six hours a year? What practical results could she expect? And yet that is what some schools are doing in the manual arts and are looking for practical results. It is impossible. A few are giving from three to five hours a week and are beginning to get results. This amount should be further increased.

In the high school the manual arts have become differentiated into special subjects, as dressmaking, wood-turning, forging, machine drawing, etc. As a method in education they are still valuable, but it is the educational end they serve far more than any value in the educative process that gives them their place in the curriculum. The end sought may

be vocational or general, but in either case the arts taught should be so correct in technic, should place such emphasis on processes that are fundamental, should be so in harmony with the corresponding industry that they will have distinct vocational value as far as they go.

Possibly they may go far enough in the high school or even in the grammar school to give to selected groups of students all that any school can give toward a trade or occupation, but whether the manual arts aim for immediate vocational results or not, the technical standard should be the same.

The place of the manual arts in school education, then, is that of both subject and method. As method, it is most effective in the primary grades. As a subject, it grows more and more important as the grades advance, and becomes a highly specialized subject or group of subjects in the high school. A full recognition of these two aspects of the manual arts, and what naturally follows as a result, should be a help to every teacher and school superintendent in organizing his course of instruction.

CHAPTER III.

The Development of Appreciation.

TWO of the direct results of instruction in the manual arts are, first, power to do, and, second, ability to appreciate what is done by others. Both of these results must be embodied in the aim of the teacher who would wisely guide his pupils in work in the manual arts. Emphasis is rightly placed on the first, but the second deserves more thought than it usually receives.

Froebel tells us that "man only understands thoroly that which he is able to produce." Accepting this statement as fact, we see that it is only thru mastery of processes, tools and materials, color, form and values, laws of construction and harmony, that we can completely understand any masterpiece of art or handicraft. And we know from experience that such mastery is exceedingly difficult to acquire.

William M. Hunt in his "Talks on Art" [1] has given emphasis to the same fact when he says, "I flatter myself that I know and feel more than I express on canvas; but I know that it is not so." Here is the point of view of complete mastery of materials and processes. If one becomes a master

[1] First Series, page 5.

of brush and pigment, he can express his thought and feeling thru painting, and it is only thru such power of expression that one comes to know the thought and feeling expressed by other painters—to fully appreciate a great work in painting. But here again we who would appreciate art and handicraft find that it takes a lifetime to gain the mastery of even the painter's art; and when we think of sculpture and metalwork, cabinet-making, textiles, jewelry, the building of a cathedral, a great bridge or machine, we realize how impossible it is to fully appreciate work in all these arts and crafts. With our human limitations, the span of a single life is not long enough to include so much, yet we desire the power to appreciate the good in the arts and to help others to do the same.

So we are led to try another and easier course. We throw aside the philosophy of Froebel and seek to store our minds with facts about the arts, in the hope that by this means we may reach our goal of appreciation. We search the latest books and magazines. We read what Mr. A. says of the opinion expressed by Mr. B. concerning the work of Mr. C. We find that Mr. D. does not agree with either Mr. A. or Mr. B. on several important points, and we take little satisfaction in knowing their combined opinions. When we are honest with ourselves we admit that we do not appreciate the real thing they are writing about. Like the young clerk in the draperies department

of a downtown store, we can talk "arts and crafts style" or we can discuss the report of the latest exhibition, and quote good authorities too, but we are conscious of the fact that this is not appreciation. We know that appreciation involves feeling, and this newspaper reading has begotten no art feeling in us. We would not only know about art, but we would feel—we would respond to the influence of the art; we would have the artist's emotions transmitted to us, and this we find does not come about thru the medium of words merely. We must see and touch and do; we must get our knowledge first-hand; we must learn thru experience. In learning *about* the art we have avoided the thing itself. As Dr. Munsterberg points out [1], we have taken the scientist's attitude instead of the artist's —"The scientist explains, where the artist appreciates."

This brings us to our problem: If we cannot learn to appreciate the arts by reading books and magazines, and if life is not long enough to allow us to secure the mastery of all the arts we would appreciate, what are we to do? Is there not a median course open to us? For our purposes, can we not combine the scientist's explanation with the artist's appreciation? Would not such a course be in harmony with the aim of the public school? If so, is it possible, and what does it involve?

[1] *The Principles of Art Education*, page 28.

Perhaps we may get a suggestive illustration from music: We would appreciate the oratorio. We read of the origin and early form of the oratorio and its identity with the opera. We read the life of George Frederick Handel, a description of his "Messiah," and learn of the effect it produced when it was first given in the city of Dublin. We read of its presentation in London shortly after, when the audience was so electrified by the "Hallelujah Chorus" that the King and all present rose involuntarily and remained standing till its close. We are interested in this account, but the reading does not enable us to appreciate the oratorio. Next we go to the Auditorium and hear the "Messiah" presented by noted soloists and the great chorus and orchestra. We are more than interested now, tho many parts of the composition find no response in us—we have not been educated in music. The grandeur of other parts, however, does affect us, but we do not yet appreciate the oratorio. Then we learn to sing, and join the great chorus. Under the inspiring leadership of a Thomas or Damrosch, we sing the parts over and over; we rehearse with the soloists and orchestra; and on the night of the concert we pour out our souls in music till we are lifted above ourselves and things of earth and are touched by the same emotion that inspired the composer. We may not think we see "all heaven before us and the great God Himself" as did Handel when he

wrote the "Hallelujah," but we have in some measure come to appreciate the "Messiah," and we have established a basis for the appreciation of all other oratorios.

Another illustration from music: A boy in the fifth grade in the public school read in his school reader an account of the writing of Mozart's "Requiem." He read how the unknown visitor came and gave Mozart the commission, how he disappeared so mysteriously that Mozart believed the stranger had been sent from another world; he interpreted the coming as announcing his own approaching end, and so applied himself with increased ardor to the task of writing the "Requiem." Later the boy learned to play a selection from the "Requiem" on the piano and recalled what he had read two years before. He hunted up his old reader and re-read the story; then going to the piano he sat down and played the selection again. It was evident that his emotions were affected by the music as they had not been before. The "Requiem" had a new meaning to him; he had reached a stage of appreciation which was not evident before he re-read the story, and certainly not before he learned to play the selection from the "Requiem." He does not yet fully appreciate the "Requiem," but he has the foundation for a growing appreciation.

Turning now to the manual arts we may find similar illustrations. A young man sees a water-

color painting and likes it, but he does not appreciate it until he has struggled with muddy washes and hard edges and false values and learned to produce something of that purity and delicacy of color and those atmospheric effects which belong particularly to paintings in water-color. He may have read much about water-color painting and water-color paintings and water-color painters, but he gets only part value in return for his reading until he has studied the art itself. After that, the reading is of great value.

The same is true of the art of smithing. Not until one has drawn out the hot iron with the hammer and anvil and discovered the difficulties in making a graceful bend or a neat weld can he appreciate medieval wrought-iron work. Until then the hinges on the doors of Kenilworth Church or Notre Dame Cathedral are so many black scrolls and sprays. They might just as well have been made of painted stucco as nobly wrought metal. After he has himself worked in iron, every fact in the history of the craft, and every masterpiece has a new interest to him. The fact that so few of us appreciate wrought iron is why we accept substitutes from those who would deceive us.

A short time ago while in an art store a clerk wished me to admire some pieces of copper work —"A very fine new line, just in," she said, and then spoke of the individual pieces in most enthusiastic terms, telling me that they were all

beaten up by hand. The moment I saw them I knew they were not hand work. Having hammered copper myself, I knew that the pieces before me were not even good imitations of hand work, and so I pointed out her mistake. She still insisted and carried the case to the proprietor for vindication. Much to her chagrin he admitted the truth. The clerk herself did not intend to misrepresent facts; she was merely repeating what had been told her. She had no appreciation of the wares she was trying to sell. She could talk glibly about a dozen kinds of handicraft work, but she had no real appreciation of any of them. Every day she was misleading an ignorant public that came to the best art store in town to buy genuine art products.

In this connection it is well to remember that one may be attracted by the form of an object or its use without appreciating it as an art product; or, in painting, one may be interested in the subject of the composition and may value the picture without appreciating the painting as a work of art. I used to know a man who painted pictures of farm houses and cornfields and sold them to the owners of the farm houses. The farmers bought his pictures not because they appreciated the painting, but because they were interested in the thing he represented in his pictures. If they had appreciated painting they would not have bought his pictures. Appreciation of an art, then, demands a high standard in works that are representative

of that art. To raise the level of appreciation in a community is to raise the standard of art products that can be sold in that community.

What we have observed to be true in reference to the arts of painting and metalwork is equally true in reference to any of the mechanical arts. For a generation our engineering colleges have recognized that to read about pattern-making, or moulding or machine construction, is not sufficient for the engineer, even tho as an engineer he may never have to do the handwork. In order to gain reasonable knowledge of processes and an appreciation of quality in construction, it is essential that the student in training have actual shop experience in all the fundamental crafts he is likely to deal with as an engineer. In this way only can a feeling for good workmanship—an educated sense of fitness—be imparted in the short period of the school preparation of an engineer. But here, too, mere practice in the craft is not sufficient. Along with the practice must come a study of the theory of construction and the economics of its application to industries, also a study of the materials employed, the source of supply, methods of refining, etc. The student gets the theory and the practice—the science and the art—together. Each helps the other.

If these illustrations have been pertinent to the problem under discussion we may infer, (1) that some definite knowledge of the technic of an art

is fundamental to any real appreciation of that art, (2) that appreciation involves feeling which can be gained only thru experience in the art itself, (3) that after such experience, appreciation may be developed by reading about processes, methods, motives, relationships, about the masterpieces, and especially by studying the works themselves.

With the foregoing discussion in mind we may now turn our thoughts for a moment to the public schools. The aim of the public schools, in reference to the manual arts, is not fundamentally to turn out a few great artists and master craftsmen. It is rather to educate many pupils to a reasonably high degree of industrial efficiency, and to give all pupils the power of discrimination and appreciation. With our present ideas of training for citizenship in a democracy, we usually discourage much specialization in the elementary school, and aim to produce a high general average of manual efficiency. We prefer considerable familiarity with several crafts to expertness in one. Likewise in the matter of appreciation we prefer to have it cover a wide range of handicrafts rather than be narrowed down to one or two.

Accepting this point of view, for the present, at least, it follows from what has been said that in order to develop the kind of appreciation we want in American citizens, it becomes necessary for the public schools to give instruction in a variety of arts and crafts rather than to confine its efforts

to one or two. Without forgetting the dangers of a mere "smattering" of a subject, we recognize the importance of an intimate acquaintance with a variety of materials and processes as the basis for a broad appreciation. Moreover, such acquaintance is the foundation for effective work in vocational guidance. A course thru the grades consisting merely of paper and cardboard work, still-life drawing, and a course of benchwork in wood is decidedly inferior to a course which includes fundamental processes in (a) the graphic arts—drawing and picture making, (b) the mechanic arts—woodworking and metalworking, (c) the plastic arts—modeling and pottery, (d) the textile arts—weaving, braiding, sewing, and garment making, and (e) the bookmaking arts—paper and cardboard work, lettering, bookbinding and leather tooling. Not one of these five subdivisions of the manual arts can be omitted from the course without correspondingly limiting the possibilities for the development of appreciation.

But it is not sufficient that the child do the work merely, even in all these varied arts and industries; he must be led to see beyond the work of his own hands; he must learn something of the relationship of each art to the great out-of-school world into which he will soon be thrown, and to the history of industrial effort. Information concerning the origin and development of any art—the social conditions that called it forth and nour-

ished it—will give the pupil's own work new significance. The masterpieces, too, and the experiences of the men who created them, should be an inspiration to him. Biography, history, economics, science and literature may all contribute elements to his developing appreciation.

The development of appreciation in the manual arts as a factor in public school effort does not mean less handwork and more information, but it does mean more information of a significant character connected with the handwork, from whatever source it may come. It means a new point of view for many teachers of the manual arts, and especially it means enrichment of the course of study and rational correlation.

CHAPTER IV.

Vocational Training—To What Extent Justifiable in Public Schools?

IN business the amount of money that may profitably be spent in advertising depends upon the financial returns from such advertising. Whether a business house can afford to spend one thousand or one hundred thousand dollars in educating the public up to its standard of quality and taste depends upon the returns it can get in sales which are the result of such educational expenditure. There is no limit to the justifiable expenditure so long as the returns come in in sufficient ratio to the capital invested in this way. Likewise the question of how much the business house can afford to spend in the special education of salesmen depends upon the returns in sales in proportion to the outlay for education and wages.

This same principle holds true in public education. Any expenditure is justifiable so long as the returns are sufficient in kind, quality, and amount. In this case, however, the returns are not in terms of dollars for the business corporation, or salary for the individual, but in terms of benefits realizable by all the people of the city, the state, the nation—by the public. The late General Francis

A. Walker once said that the demand for public schools "has been purely socialistic in character, springing out of a conviction that the state would be stronger, and the individual members of the state would be richer and happier and better if power and discretion in this matter of education of children were taken away from the family and lodged with the government." It is of the greatest concern to the public how the children of the nation are educated, and the nation or the state is justified in adopting any reasonable measures that will produce efficient citizens.

The more one studies the history of the public schools the more it becomes clear to him that the great purpose of such schools is fundamentally vocational. We are aware of the fact that it is customary to speak of the aim of the public schools as being, first, cultural, and incidentally vocational. From the standpoint of the state, however, the former may be regarded as incidental to the latter. General education—at least, that part of it that is given during the first six years, which we call elementary education is, so far as the state is concerned, but the beginning of an education, the whole of which is the making of efficient social units. And an efficient unit of society must have a vocation, and to be most efficient that unit must be trained in some way—either in public schools or at private expense or thru vocational experience or by means of a combination of these. Elementary

education is, then, from this point of view, the foundation of a structure which is essentially vocational. And it is, or ought to be, just as fundamental to success in the vocations connected with the industries as with the professions, and, in fact, far more so, if there must be a difference, because the great majority of students go into the industries. But whether we regard elementary education as chiefly a means to vocational ends or not, the fact of a vocational end in public education as a whole seems evident.

The economic value of education certainly is not sufficiently appreciated in America. We believe, in general, that education makes a man a better member of society, but we do not believe it in particular. We realize that an educated man has greater possibilities of making himself useful, but we do not see clearly the economy of educating every man to the point of making him the most efficient possible social unit. As some one has said, we believe in educating corn until it contains the highest possible proportion of the desired elements; we believe in breeding horses and cattle and hogs and poultry; but we have not yet come to realize that educating men is just as profitable, provided, of course, that the education is in the direction of giving the best possible social results. We seem to be a long way from an appreciation of the full value of a healthy, efficient, happy human being. Perhaps the cultivation of such

beings is to be the great work of the twentieth century. If so, vocational education is going to be a big factor in accomplishing the desired result.

Greater emphasis on the vocational elements in education need not cause any sacrifice in the total cultural effect. On the contrary it will tend to raise the general average of culture, (a) because it will keep pupils in school longer, and (b) because the vocation may, for many students, become the most effective focal center around which a broad education may be gathered. There are two roads to a broad culture—one by way of a course that is general from beginning to end, the other by a narrower, vocational course which, if pursued long enough, is bound to lead out into paths covering the broad field. Dr. Kerchensteiner of Munich, when in conference with the Illinois Educational Commission in Chicago, indicated that it was his belief that of the two roads the latter was the better. It is not in harmony with the curricula of our American schools, but it is in harmony with one of the fundamental laws of our educational psychology. It possesses the advantage of building upon natural interests, and in addition to this, it insures getting to some definite end which is socially worth while. It would seem that the carrying out of this theory in the schools of Munich is striking a new note in educational method. Herbart would make history the focal center of the curriculum; Colonel Parker would

give that place to geography; but it has remained for Dr. Kerchensteiner, with his social and pedagogical insight and his rare statesmanship, to make the vocation of the individual the focal center for his education, thereby elevating the vocation, while at the same time leading the student in the most natural possible way out into broad fields of knowledge and culture. Such a program is not a study of the humanities with humanity left out; on the contrary, it is in vital touch from beginning to end with the work and thoughts, the aspirations and the victories, of human experience. While making a student, it produces also a man—an efficient social unit. The best vocational education, then, is also cultural, and the best cultural education may come thru a training that is fundamentally vocational.

Coming now to the question before us, we may say that in so far as vocational education is economically profitable to a city, state, or nation, it is justifiable, but as a matter of course, it should not take the place of any fundamental education that is more profitable.

The nation is justified in training a few military leaders at West Point and Annapolis because the welfare of all the people of the nation, in time of war, depends upon the knowledge and leadership of these few experts. The nation is justified in educating chemists and biologists to test foods and prevent the spread of disease, also to train meter-

ologists to prognosticate concerning the weather, because all the people benefit directly or indirectly by their work. By the same token the state is justified in educating every man to his highest efficiency in his chosen occupation, provided that in the pursuit of that occupation he serves the community in a beneficial way. It is not the function of the state to educate pickpockets and hold-up men, boodlers, yellow-journalists, and anarchists. Indeed we should do everything possible to eliminate the kind of vocational training that produces these in our midst. They are a very dangerous by-product of our social system, and may be, in part, at least, the result of our failure to give vocational guidance and adequate vocational training in the schools.

For a striking illustration of the value of vocational education to a nation, we may turn to Germany:

Years ago English manufacturers were bothered by the importation of cheap goods from Germany. As England had no protective tariff to prevent such damage to her markets she resorted to an ingenious device, passing a law that all goods coming from Germany should be marked "Made in Germany." The aim in this act was to create a sentiment against such goods, and to warn every English buyer against the inferior imported articles that were threatening to undermine cer-

tain English industries. "Made in Germany" was thus intended to signify inferiority.

To an aspiring commercial nation this was a severe blow. It was in fact humiliating; but it was accepted as a challenge. Germany set about to turn the trick back upon England, and quietly developed her remarkable system of industrial schools and compulsory continuation schools. Her scientists and artists multiplied and focused their efforts upon industry. The quality of her goods improved steadily until today the phrase "Made in Germany" stands for a substantial quality and artistic finish that command the attention of the markets of the world. In many instances German products have crowded out English goods.

In January, 1899, Germany's mastery of one of England's greatest industries had enabled her to produce that splendid steamship, "Kaiser Wilhelm der Grosse." This great vessel, perfect in every detail, had just crossed the Atlantic, making the swiftest passage of any vessel. With glowing pride in this achievement the captain painted on the side of his vessel, in great letters, the legend, "Made in Germany," and triumphantly sailed up the Solent to the port of Southampton. This was a fine bit of retaliation, and it was appreciated.

After relating this incident to a body of students, J. H. Reynolds, director of the Municipal Technical School at Manchester, said, "The efficient cause for all I have been saying about Ger-

many is her schools." Germany believes that education pays because it helps men to become more efficient and she believes in making it compulsory because every worker should have a chance to rise to his highest efficiency, not only for his own sake but for the sake of the nation.

Vocational training is justifiable in the public schools to such an extent as will be effective and economical in producing efficient citizens.

CHAPTER V.

The Selection and Organization of Subject-Matter in the Manual Arts.

IT seems unnecessary and even undesirable to attempt to draw a sharp line of demarkation between the manual arts for vocational ends and the manual arts for general educational ends. We should recognize a dual end in education, but we would not sever the whole educational system by a social line as Europe has done, and we would not start on that road by trying to separate the practical from the cultural in the subjects of instruction. With reference to this matter we believe that the layman who views school work from the outside and calls all handwork by the same name—all manual training or all industrial training or all vocational training, whichever word may have come into his vocabulary—is nearer the big truth than the educational expert who tries to divide what is and, in the nature of things, should be fundamentally an indivisible unit. The expert may point out different aspects of this unit and give them names, but he cannot make clear to the layman or the practical workman who thinks for himself, just where lines can reasonably be drawn

between the two. Why, then, should we try to emphasize such differences?

But let us see; let us consider the matter. And in order to do this in a reasonable way let us first eliminate all manual training that is not practical—that does not help in the formation of good habits in the use of tools and train for intelligent workmanship, and at the same time eliminate all vocational work that makes a man a mere machine—leads him into a narrow alley of thought and effort. This will eliminate a great deal of trash that by sufferance still passes under the name of manual training, but ought not to any longer because something better is here to take its place. It will also eliminate much repressive work now done under apprenticeship agreements, and some done by part-time and co-operative schools; but this also ought not to continue because a better way for all concerned has already been pointed out. After eliminating these, what is left has more likenesses than differences. The differences are no greater than between arithmetic and shop arithmetic; both are arithmetic, but the approach or the selection or the application is different. In both the same eternal fundamentals are taught. Just so in woodworking or metalworking; the fundamentals that are at the basis of any good work in either manual training or vocational training in these subjects are identical. This fact is so easily recognizable by every man who has been both a

practical workman and a teacher that it seems unnecessary to instance the early history of manual training when the fundamentals—the elements of instruction—were obtained by subjecting the best practice in the mechanic arts to a process of analysis with reference to teaching, or to the fact that in the best trade courses today both in this country and Europe—those which have become well established and are turning out skillful men—base their instruction on these same fundamental elements. So far as the fundamentals of hand-tool instruction are concerned the main difference between good manual training and good vocational training is in the amount of time and the age of students, and not in the fundamental elements themselves.

This, however, is not the whole story. There is a notable difference between arithmetic and shop arithmetic and that is in its application to modern shop problems. Likewise there is a difference between manual training woodworking and vocational school woodworking and that difference is in its application to modern shop conditions. In other words, vocational woodworking is good manual training in wood plus the factory system. This formula seems too simple a one in which to state the complex situation we sometimes hear about in educational meetings and in the educational press, but we believe it to be true. And if it is true for woodworking, it is likely to be

just as true in other manual arts that have come under the modern factory system.

By this formula, however, one should not attempt to solve all the problems of external and internal organization nor of method, tho it may help in some of these. The addition indicated in the formula may be performed in a physical sense, as by fusion, or in a biological sense as by natural selection thru a process of growth, using the best available means. Both of these processes are going on in vocational school experiments. And whichever way the addition is being performed there is always to be found on the inside a unity in the art that is being taught which is far more vital for the future of all this great movement in education than are the superficial and organization differences.

When we analyze the situation for ourselves, instead of accepting somebody's dictum, we are forced to the conclusion that there is no sharp fundamental line of demarkation that should be drawn between the manual arts for vocational ends and the manual arts for general educational ends. The factory system which has been a distinctive element in vocational schools has seemed to suggest the most reasonable line of demarkation, but, as has been shown, pedagogically speaking, the factory system in the school is essentially a means of teaching the application of fundamentals, which are the very essence of

manual training work. In the interests of future development this unity should be maintained and strengthened.

Accepting this point of view, no marked distinction will be made in the following discussion between the arts pursued for vocational ends and those for ends usually denominated as cultural or general. Indeed, an effort will be made to forget that there may be any difference.

1. It is desirable to select subject-matter that has some industrial value at the present time in our own nation or state.

At Bradley Institute there is an exhibit of fish traps, basket work, and mat-weaving that came from the Philippine Islands about a dozen years ago. In several respects it is a remarkable exhibit of handicraft. It represents a great deal of skill and knowledge. It would be quite possible, with the requisite materials imported to this country, to work out a course of problems which, if taught thoroly in our upper grammar grades, would enable our American boys to make good fish traps of the Philippine type, also baskets and mats. But who would be willing to recommend that such work take the place of our own American woodworking and metalworking in the schools? Even though it were proven that the physical and mental effects of the fish trap course were superior, we would still refuse to make the substitution simply because we have no use for such fish traps, except

to place them in museums. On the other hand, knowledge and skill in woodworking and metalworking are usable in America. Woodworking and metalworking with American bench tools have an industrial value.

The city of Strasburg has developed a peculiar course in wood-carving. The work is done with tiny carving tools set in engraver's tool handles. In carving, a student takes a small block of wood about three inches square and holds it with his left hand on another block that is fastened to a desk top. He works in about the same way as an engraver of copper or silver who, with his left hand, holds his work on a leather pad filled with sand, while with his right hand he holds the tool and does the cutting. We would not recommend this type of work in the United States, even though we considered it good manual gymnastics, because it has very little or no industrial value. It is neither real wood-carving nor is it good wood engraving. It is merely a hybrid industrial work developed by a school teacher for disciplinary purposes. If we are to teach wood-carving in the manual training school, it should be the kind of wood-carving used in America.

To meet our first demand, then, the subject-matter of the manual arts must have some industrial value in the country where it is to be taught.

2. For public school instruction it is desirable

to select subject-matter from typical common industries rather than from the exceptional and uncommon ones.

If we consult the United States census for 1910, we find that 36 per cent, or 10,851,000 of the male population above 10 years of age, who are employed in gainful occupations are engaged in agriculture, forestry and animal husbandry; 29 per cent, or 8,837,000 are engaged in manufacturing and mechanical industries; 10 per cent, or 3,146,000 are engaged in trade; 8 per cent, or 2,531,000 are engaged in transportation; and less than half the latter number in each of the following: clerical occupations, domestic and personal service, professional service, public service and the extraction of minerals. This shows that agriculture employs the largest number of men, that manufacturing employs the second largest, and that these two together occupy the time of 65 per cent of the entire body of male workers. This would seem to indicate that the school is making no mistake when it looks to agriculture and manufacturing for subject-matter.

If we carry our analysis a little further, making a distinction between farmers and farm laborers, assuming that the former need more schooling than the latter, we find that more than half the total number engaged in agriculture, or about 5,850,000 are in occupations in which a good education ought to be regarded as a necessity. If

we analyze the workers in the manufacturing industries we find about the same to be true: A little more than half, or about 4,700,000 are skilled workers, 1,725,000 are semi-skilled, 2,400,000 are laborers, and 100,000 are apprentices.

If we carry the analysis still further we find that by grouping together the brick and stone masons, the carpenters, the builders and building contractors, the plumbers and gas and steam fitters, and the painters, glaziers, varnishers, etc., we have the building group of 1,643,000 skilled workers. Then by bringing together the blacksmiths, forgemen and hammer men, the machinists, millwrights and toolmakers, the molders, founders and casters, the tinsmiths and coppersmiths and one-half of the foremen, overseers, manufacturers and officials we have a metal industries group of 1,092,000 skilled workers. It should be remembered in this connection that the number of semi-skilled and unskilled workers in the metal industries is especially large, being over 900,000.

Besides these two major groups there are smaller groups, such as the printing and publishing industries, the textile and clothing industries, the shoe and leather industries, and the group of engineers and electricians.

It would seem to be clear, then, that in the two great fields of agriculture and manufacturing, American schools should seek subject-matter.

3. The selection of subject-matter in any industry should be based on an analysis of that industry. The same is true if the subject-matter is to be taken from a group of industries.

Of all the heretical notions that have crept into our discussion of industrial education during the past few years none seems to be more damaging than the idea that all you have to do to give a boy a vocational education is to give him jobs of work to do after the manner of the factory. We realize that this idea came as a reaction against a supposed or a real over-emphasis of logical procedure in rigid courses of instruction in handwork. But that is not sufficient excuse for throwing aside forty years of experience and going back to the point where we began in 1876. Even the factories themselves have proven that this is not the best way to educate their apprentices; they have established non-productive shops or semi-productive shops where courses of instruction organized from the teaching standpoint are given. If proof were necessary several of the corporation schools in this country could furnish ample evidence that work organized for instruction purposes is quite different from work organized for the immediate production of manufactured goods. In other words, the factory method of employing a boy's time is not the most economical from the instruction standpoint.

If this be recognized as fact then the road seems clear toward the organization of work from the teaching point of view, and this involves selecting fundamental elements of subject-matter. This selecting, in turn, involves an analysis of the processes of the industry itself. All the famous courses in handwork, whether for the training of mechanics, like the Russian system, or the course in the technical school at Chalon, France, or in the Carnegie Technical School in this country; or for general education, like the sloyd work of Finland, Sweden and Denmark, or the manual training system of France, Germany, England and America; or in the highest schools of art craftsmanship in England, France and Germany;—in all of these the courses in handwork are based upon an analysis of trades, or groups of trades or industries or parts of these. In every case some more or less definite field of industrial work is selected—usually one trade, or several very closely allied trades—and analyzed with reference to selecting elements of subject-matter to use in instruction.

But not all analyses of the same trade are alike. One may be better than another.

The usual analysis reduces the processes of the trade to its simplest teaching elements, so that they appear one after another in mathematical order, like a string of beads, where the biggest is at one

end, and all are graded down to the smallest at the other.

The group analysis is the division of the process into masses or groups of homogeneous or related matter. These may or may not be graded. They may be like the little bear, the middle-sized bear and the big bear in the story of the three bears, or they may be like bears of the same size. In either case each group must contain some vital element or elements in the process.

A course of instruction based on the string-of-beads or course analysis takes into consideration the capacities and sometimes the interests of the average normal child to be taught, but it is weak because it is narrow and rigid; it may easily become stereotyped for the reason that it treats all students alike—it "runs them all thru the same mill." This kind of analysis used as a basis for the selection and organization of subject-matter in certain manual training work would seem to be the cause of reaction against such work.

A course of instruction based on a group analysis is better because it is flexible. It allows for individual differences. It lends itself far better to the use of factory methods in so far as they may be used at all to advantage. It seems to be in harmony with what has come to us thru the study of the principles of modern pedagogy.

The selection and organization of subject-matter, then, should be based upon an analysis of the

processes, trade, industry or industries studied, and that analysis should be made with reference to discovering groups or masses or chapters of subject-matter in each of which there are fundamental, vital elements.

4. The trade or industry analyzed for the purpose of obtaining elements of subject-matter should be typical and modern.

It is quite possible to make an analysis of industrial processes that are not typical. For example, one might readily find a man called a machinist in a big factory and follow him in his work from day to day, making an analysis of his trade, but it would be found to be lacking in elements which are considered vital in the equipment of a machinist for another shop. And so the question arises, Where shall we find the typical machinist? in the big factory or in the small? in the specialized work of the big industrial city or the more varied work common to the smaller town? To train men for one set of factory conditions is not usually regarded as the highest type of vocational education, and certainly not the best general education. The typical example of a trade or industry is not always easy to find, but it should be sought for purposes of educational analysis.

Besides being typical it should be modern. The analysis of cabinet-making as it would have been made by a New York or New England cabinet-maker of fifty years ago would be defective today.

The same would be true of nearly every trade or industry. Re-analysis will be needed from time to time. It does not take very many years in some industries for a process to become obsolete. The school should recognize this fact in selecting its subject-matter for industrial courses.

5. The resulting groups of subject-matter may vary greatly in amount, in time required, in general character, but each must contain some element or elements vital to the subject under instruction and the groups should, as a rule, be arranged in some sequential order.

For fear that there may be some reader who is afraid of that word "sequential," it should be stated that the resulting groups mentioned are not based on the string-of-beads or course analysis, but rather on the group analysis: there is a great difference. There is no reason to be afraid of a sequential order if it does not lead to stereotyped teaching. It surely is a safeguard against attempting things too difficult. It is also an insurance against lack of preliminary training.

By way of summary we may again ask and briefly answer the question: What should govern the choice of subject-matter in courses of study in the manual arts?

Subject-matter in the manual arts must have some industrial value whether it is given in a vocational course or in a scheme of general education. It should be taken from typical, present, common

industries rather than from obsolete or uncommon industries or parts of trades, except of course in the case of highly specialized vocational courses which are intended to meet specific demands. The selection of subject-matter in any industry should be based on an analysis of that industry. This analysis should be made with reference to finding groups of related subject-matter, each of which is vital to the industry being taught. Only such examples of the industry under consideration as are typical and modern should be used in making this analysis. The resulting groups of subject-matter should then be arranged in sequential order for purposes of instruction.

It is believed that these are safe governing propositions whether the instruction be given in a vocational class or is an integral part of a scheme of general education.

CHAPTER VI.

The Group Method of Organizing Subject-Matter in the Manual Arts with Reference to Teaching.

THE Group Method of organizing subject-matter in the manual arts grew out of an effort to harmonize class and individual methods of instruction. The Russian system of tool instruction with its "string-of-beads" course or analysis and its tool exercises and joints demonstrated the value of class instruction. The Swedish sloyd, also with a "string-of-beads" analysis, but with useful models, emphasized individual instruction. The Russian system was developed to train men for service in connection with the government railways. The aim was to produce intelligent and skillful workers as rapidly and economically as possible. Consequently the class was the center of the teacher's effort. Consideration of the individual was secondary or supplementary. The Swedish system was evolved as part of a scheme of general education. Its first aim was child development, and having this aim, it recognized individual differences, and so insisted on individual instruction. The coming together of these two systems in the United States resulted in clashing

of ideals and methods out of which has been developed an American system which is essentially different from either but includes elements gained from both. The group method of arranging the course came from neither one, but it was the result of an effort to combine the economy and stimulus of class instruction with the best consideration of the needs of individual pupils.

In the period before 1893 it was the common fault of teachers who had been trained to or had imbibed the idea of class instruction, that they constantly strove to keep all the pupils of a class together in their work. The striving of these teachers was constant because their aim could never be accomplished under ordinary school conditions. Children were not alike and they could not be made so. Many were the devices resorted to in this vain effort. Some of these may be illustrated by observations made on a tour thru cities in Massachusetts, New Jersey and Pennsylvania in 1892. For convenience the schools visited may be designated as A, B, C, D, and E.

A was a manual training high school. Here the teacher of woodworking was demonstrating the making of a dovetail-lap joint. At the close of a very skillful demonstration he said to the class, "These joints must all be handed in tomorrow afternoon at three o'clock." When questioned about this statement he said that there would be no

difficulty about the matter. He was sure that even the slowest in the class could get the work done by that time. When asked what the rapid pupils would do who completed the work before that time he said. "They will be excused, and allowed to go to the library or to the drawing room to do other work."

This teacher had avoided the usual problem by gaging his work to the capacity of the slowest pupil and then excusing pupils as fast as they completed the required work. This was no solution of the real problem because in most schools teachers were required to keep all their pupils and to keep them busy until the end of the class period.

B was a normal school. The teacher was asked if he had any difficulty in keeping his class together for class instruction. "No," he replied, "as soon as the first pupil has completed the given model I call the class together and demonstrate the next one. All go to work on the new model, and the previous one has to be completed out of regular class time—mostly on Saturdays." When the remark was dropped that some pupils might need a good many Saturdays, he cheerfully replied, "Yes, already some of them have all their Saturdays spoken for to the end of the year." This was in the winter.

Like the teacher at A this one had avoided the real problem, but unlike the teacher at A, he had

gaged his work by the fast pupil instead of the slow one, and thus accumulated difficulties for himself and his pupils.

C was an ordinary high school with a manual training annex. When the teacher was asked what he did with the rapid worker who completed his joint before the other members of the class, he said, "I give him repair work to do about the shop. If a bench needs fixing, or a belt needs lacing, or a drawer needs to be planed off, I keep him busy at that till I am ready to demonstrate the next exercise." "Do the boys like it?" he was asked, "Yes, they look upon it as a reward of merit." He admitted, however, that if they ever ceased to look upon such work as desirable, he might have some difficulty with his plan. In this case the personality of the man was a large factor in the success of the plan in this particular school.

D was a well organized grammar school center. When the teacher was asked whether he had experienced any difficulty in keeping his rapid pupils busy while they were waiting for the others to catch up, so that he could give class instruction on a new exercise or model, he said, "Last year as soon as the first boy completed the first exercise in the course I gave him a blueprint of a stool and told him to get out stock for the legs. He worked on that till the demonstration of the second exercise was given. He was usually ahead

on the second exercise also, and then did some more work on his stool. This continued until the end of the year when several of the boys had completed their stools besides all the required exercises and models." When asked whether the plan was a success he said, "Yes, only some of the boys wished they had never seen those old stools before the year was out." The breaking off and beginning over and over again was too severe a strain on the boys' interest. "I have a new plan this year that is working out better," he said, and then showed some blueprints of exercises in chip-carving. "As soon as the first boy is thru his first exercise I give him a block of wood and a blueprint, and tell him to lay out the first exercise. He can usually do this. Then I show him how to cut out a chip, and he proceeds with the work. It doesn't take him long to complete the first exercise; then he takes the second, and so on. As a reward to the rapid pupils, when they come to the towel roller, each one carves a design on it, while the slow pupils finish theirs without the carving."

The teacher was asked whether he had ever noticed that some pupils prefer the carving to the regular work, and so are inclined to slight the latter to get more time for the former. He said he had. Likewise he admitted that some preferred the regular work and always managed to

slow up enough toward the end of an exercise so that they would not have to do the carving.

The testimonies of the teachers at C and D seemed to indicate that the solution of the real problem did not lie in the direction of doing two kinds of work—one as the regular course and the other as busy work.

E was a grammar grade center. In this school the teacher had come one step nearer to finding a solution of the problem. He had arranged two parallel courses—one of exercise pieces, and the other of useful models involving the same processes as the exercise pieces: One of these suggested a Russian course, the other a Swedish, tho all the models were thoroly American in design. As soon as the fast boy had completed an exercise he was given the corresponding model in the parallel course as a supplementary problem. Comparing this plan with that of the teacher at D, it had the advantage over the stool of not requiring so much time for completion and over the chip-carving of being work of the same general character as the required exercise. It had the added advantage of involving a repetition of the same processes as were in the previous exercises and of not including any fundamental ones which had not been involved in some previous exercise. This method of organizing the course, therefore, stimulated interest, enabling a rapid pupil to ac-

quire increased skill and to produce useful articles of a higher order.

The net results of all these observations was the conclusion that instead of trying to devise schemes for keeping pupils together, an effort should be made to so organize the work that each pupil would develop freely as an individual while at the same time having the advantage of class instruction in the fundamentals of the work. Thought for the average pupil should give way to thought for each individual pupil. The idea of one fixed series of models for all pupils should give way to the idea of as many different series as there are individual pupils, yet so grouped together as to have common elements which would be subjects for class instruction. Out of this new conception of the teacher's problem came the group method of arranging the course, which was first displayed by Teachers College, New York City, at the Columbian Exposition at Chicago in 1893.

The group method is based on a group analysis referred to in the previous chapter. A course of instruction is made up of groups or blocks or chapters of subject-matter, usually, tho not necessarily, arranged in sequential order, just as one chapter in a book usually follows naturally after the preceding one. Each group must contain one or more of the fundamental elements of the

course which forms the focus or center of the group. In woodworking, for example, one such fundamental element might be the construction of a miter joint; the group might be devoted to the miter joint and its applications. Or in mechanical drawing the fundamental element might be the drawing of tangent lines; the group might include a large number of problems involving the drawing of tangent lines. This fundamental element is made the subject of class instruction.

Class instruction should also be given on informational elements, which are important for all members of the class, tho not fundamental to successful manipulation of tools. Facts concerning materials and tools and related processes in factories, commercial value of materials and products, etc., are included in such informational elements.

Supplementing this class instruction a large amount of individual instruction must be given. Even after exercising all the skill that the best teacher possesses and utilizing all the help that can be gained from note-books and textbooks and reference material of various kinds, the teacher will still have to give a large proportion of his time to individual instruction, and it is important that he have time to do this effectively.

In fact, the group method of arranging a course is intended to assist the teacher in his management of the class so that he will be able to preserve the

proper balance between class and individual instruction, while maintaining the maximum of the pupils' interest and their intelligent procedure in the work.

Working under the group arrangement, no two pupils will be likely to accomplish the same amount of work, yet all may readily pass the minimum requirement. No two will work the same combination of problems, but each may make the things that appeal most to him. One student may do work that is far more difficult than another, yet each may be most profitably employed, and both deserve the passing credit for the course.

This is just what happens in a class in history: Suppose, for example, that a history class is studying the Civil War. One pupil learns the bare facts of the chapter in the textbook; another learns these plus what he gained from several other textbooks suggested for reference; a third pupil adds what his uncle, who was a soldier in that war, has told him; a fourth has read "The Boys of '61," by Charles Carlton Coffin; a fifth has gone to the public library and searched out several large histories and some volumes of state papers published during the war. Now it is clear that at the end of the chapter on the Civil War no two of these pupils know just the same group of facts about the Civil War, but all know enough to pass on to the next topic. Each has learned according to his interest or capacity or effort. Each may have

done well for him. They are not all given the same mark, but all pass.

A group in a manual arts course corresponds almost point for point to this chapter in history. It is the same flexible, expansive mass of subject-matter. One student may do only the minimum amount required to pass on to the next group; another may complete a specified problem in the group that demands a typical application of the fundamental principle of the group as it appears in industry; another may complete a specified problem in the group that stimulates him to look up references in books or to make inquiries of industrial workers or to do some experimental work on his own account; still another may work out a project of his own designing which applies the principle of the group to an object for which he has a definite need.

To illustrate the group method of organizing subject-matter the following outline by groups is taken from the author's book, *Grammar Grade Problems in Mechanical Drawing:*

Group I. Horizontal and Vertical Lines — Layout of Sheet.
Group II. Horizontal and Vertical Lines—Dash Lines.
Group III. Inclined Lines—Foreshortening—Use of Triangles.
Group IV. The Octagon and the Hexagon.
Group V. The Circle—Center Lines—Sections.
Group VI. Tangents.
Group VII. Working Drawings.

Another illustration of the grouping of subject-matter is found in the outline for a course in forging, published by the Illinois Manual Arts Association in its report of 1911. It is as follows:

Group I. Drawing Out—Bending and Twisting.
Group II. Upsetting—Splitting.
Group III. Punching—Fullering—Swaging.
Group IV. Welding.
Group V. Case Hardening.
Group VI. Tool Making.
Group VII. Hardening and Tempering.
Group VIII. Project involving Assembling.

Each of the groups in both of the above courses includes several problems. For example, Group V in the first course includes the following objects to be drawn:

A, target; B, wheel; C, ink bottle stand; D, cast iron washer; E, mallet head; F, collar; G, bushings; H, pulley; I, roller; J, washers; K, emery wheels; L, picture frame—twelve problems given, but more may be added by the teacher if needed. A group is capable of indefinite expansion so far as the number of problems, or applications of the principles to be taught is concerned.

Referring now to the method of presenting these problems, A and B are given complete; B shows a cross-hatched section. In C the section is given complete, but the top view is incomplete. In D two views are given, and the student is

required to substitute a section for one of them. In E three views are given, but one of them is incomplete. In F two views are given to find a third, which is a sectional view. In G one view of each bushing is given incomplete. In H the substitution of a section for one view, and the completion of another, are required. In I one view is incomplete. In J the problem is given in the form of a sketch and a data table, such as is commonly used in the drafting room. In K there are really four problems given in the form of sections, only one of which is intended to be drawn by an individual pupil. In L two sections of circular picture frames are given, from one of which a drawing is to be made. If the extra problems in K and L are counted, there are sixteen specified problems in this group. It is expected that each teacher will add others of his own selection or of selections made by pupils. With so many and so varied problems to select from, the teacher ought to be able to meet all ordinary individual needs, while at the same time keeping within the range of the group—without anticipating the next group, and destroying the effectiveness of class instruction in that group. With such a group of problems, too, a teacher may assign problems in such a way that there will not be the possibility of one pupil copying from his nearest neighbor, thus getting the neighbor to do his thinking for him.

Only a small proportion of these problems should be required of any one pupil. While increased skill would be gained by doing them all, such skill might not be an economical use of time for all pupils, and the working out of all the problems by every member of the class would defeat the very purpose of the group method of arrangement. Instead, the teacher should determine some kind of a minimum standard for passing. It may be a specified number of drawings up to an acceptable grade; it may be a standard of skill and intelligence in the work, without reference to the number of problems completed. In the particular group of drawing problems given above the requirement might be stated as "Problem A, one of problems B to F, and one of problems G to L—three in all." This would allow for a very considerable range of ability, and demand at least a fair standard of attainment. However, the requirement for a given class must depend upon conditions known only to the teacher of the class or some one giving close supervision to the work.

Two very simple graphs have been devised to indicate to the pupil his individual progress and success. One shows the amount of work done and the other the quality.

Fig. 1 is a quantity diagram. Area represents work. The Figure ABCD represents the possible work in a course of study consisting of eight groups. The areas are left open at the top because the total amount of work that might be done

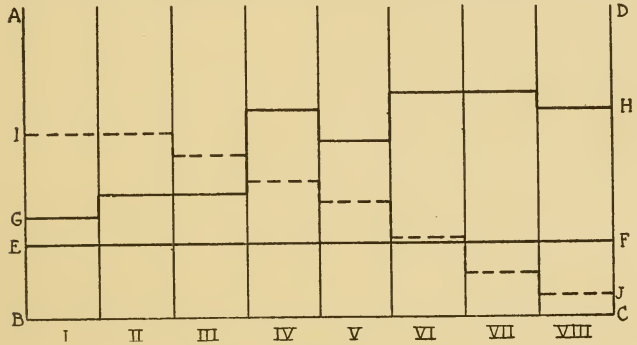

Fig. 1.

in each group is indefinite. The rectangle EBCF represents the required amount of work in the course. In this case the figure assumes that the same amount is required in each group. The line GH represents the record of one of the students in the class who has made most commendable progress. The area GBCH represents the work he has done in the course, which in quantity is more than twice the amount required for passing. The line IJ is the record of a student found in many schools. He made a brilliant start, was enthusiastic until the baseball season, when he changed to another hobby and ended the course below the required standard, though the amount of work

accomplished as indicated by the area IBCJ is greater than that included in the minimum area EBCF.

In like manner the amount of work accomplished by each individual may be represented, but, as will be readily seen, the construction of any such graph requires that the teacher shall have reasonable means of evaluating the quantity area that shall be allowed for each problem assigned. But this kind of graph may prove stimulating, even when very roughly done.

The quality graph is similar in some respects. It is shown in Fig. 2.

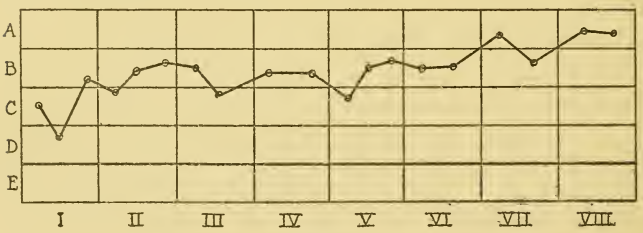

Fig. 2

The letters ABCD and E represent the usual grades, the line between D and E being the passing line. If desired, the position in the area can indicate whether a mark is high or low, plus or minus, as a high C or low C for example. Fig. 2 shows the record of one student only. It is quite possible for a teacher to have a card with the cross lines as shown in Fig. 2 for each student in the class and fill in his record as fast as work is com-

pleted. These can be kept in card catalog form and readily consulted at any time. It is quite possible for the card to represent approximate quantity as well as quality. For example, in Fig. 3,

Fig. 3

the small figures beside the group numbers indicate the number of pieces of work required in each group. The student's record shown on the card indicates, by being broken, that he has not done all required pieces of work. There are two short in Group III and the one in Group VIII. On the other hand it reveals the fact that he did one more than the required number of pieces of work in Group II.

It should now be evident that under the group arrangement of the subject-matter of the course of instruction a class moves forward together group by group, yet each member of the class grows breadth-wise, so to speak, within each group as an individual. Individual expansion or development is combined with class progress. While the use of this arrangement did not involve any

new principle in teaching, it was essentially new in teaching manual training at the time when the "war between the jointers and sloyders" began, but since that time it has come to be a commonly applied device in arranging the subject-matter of courses of instruction in the manual arts. Moreover, it deals with so many fundamental factors in good teaching that, altho it originated in courses taught for their general educational value, it is equally applicable to strictly vocational courses. It is applicable wherever there are individual differences in children coupled with a desire to give class instruction on vital or common elements in the course.

CHAPTER VII.

The Use of the Factory System in Teaching the Manual Arts.

AS one goes from city to city visiting the newer types of industrial school shops it is easy to get the impression that many advocates of vocational training think there is special virtue in the fact that a school shop is turning out a marketable factory product. Such men seem to think that all that is necessary to be done to bring shopwork up to date is to have the boys manufacture stools to sell to the local furniture dealer or study tables to sell to the Board of Education, or to make the equipment for a teachers' rest room in the high school. The inference seems to be that the school shop that can do such work must be a superior shop; it must be giving real vocational training.

On the other hand, any person who has had real vocational experience in a woodworking shop, who is acquainted with the processes of manufacturing, and at the same time is acquainted with the processes of teaching, is well aware of the fact that it is quite possible to get a group of boys to turn out a salable product without teaching them much of anything. Even the factories can do that. They are doing it right along, and it is

because such a factory system is an educational failure that schools for vocational training are needed. The accomplishment of such a feat in the school is no more guarantee of real vocational education than when the same thing is done in a factory. Merely turning out a valuable or salable product is no adequate criterion for a school shop.

A factory may or may not be a good educational institution, depending upon the way it is organized and administered. If it employs educational methods and keeps education as the chief aim, it may be a good school; if it makes material products its sole aim, it is not fundamentally an educational institution at all. A man working in it may "pick up" a trade or a part of a trade, but he might get much more of the trade in the same length of time were the shop organized to teach instead of to make money. Even the large factories are recognizing this fact, and the corporation schools are teaching their apprentices at first in a shop that is either non-productive or nearly so.

It was with some appreciation of this point of view that Bradley Institute, in the year of 1911, set out to discover thru actual experiment some of the possibilities of utilizing a producing woodworking factory as a means of teaching a vocation and as further aid in training teachers of vocational woodworking. It was realized that this was not entirely a new experiment, for similar work had been carried on successfully at Hampton In-

stitute, Virginia, and in other places. But the conditions at Bradley Institute seemed favorable for testing certain claims concerning methods of vocational training and the educative value of factory shop experience.

To go into all the difficulties encountered and the means taken to solve new problems would take one beyond the limits of the present chapter, but it is possible briefly (1) to state a few facts concerning the material equipment of the shop; (2) to explain the cost system adopted; (3) to give a summary of the results in manufactured products; (4) to state the main facts concerning the organization of the subject-matter taught and the method of procedure in teaching; and (5) to give a few conclusions based on experience.

The room selected for the factory shop was 40 by 100 feet. It was fitted up with the usual woodworking machinery. In arranging the machinery the first consideration was facility in handling the work. In other words, the considerations were chiefly those of equipping a commercial factory. The main difference was in having a long row of benches on one side of the room, but these were inherited from a former school shop and might not have been quite as numerous under other conditions. Also, some of the machinery was inherited, but that was essentially what would have been purchased if it had not been already on hand.

There was one entirely new feature of the equipment which was looked upon as essential in any school shop that adopts factory methods, and that was the trucks for storing and carrying material in process of manufacture. Whenever one goes to a school woodworking shop that claims to be giving vocational instruction by factory methods, he should at once look for the trucks. If woodworking machinery is there and the trucks are not, he may begin to question in his own mind whether he is in a vocational shop or in a manual training shop. In other words, the truck has come to be the symbol of the woodworking factory shop. It would be difficult to conceive of modern factory methods being carried out in a real way where no such trucks are available. This, then, is a summary of the factory shop equipment: machines in sufficient number, with plenty of trucks, and all so arranged that there is sufficient space around the machines for the placing of the trucks, and a clear aisle for trundling the trucks of material from one part of the shop to another. To this should, of course, be added the statement that the machines must be so arranged that a job may be routed without undue waste of time in going from one machine to another.

No school can afford to maintain a woodworking factory without disposing of its products in such a way as to pay for the material used. This becomes a problem because a woodworking fac-

tory requires a large amount of lumber to keep it busy. Some schools can find a market for their school factory products in their own institution; others will find it necessary to seek a market for at least a part of their products. Bradley Institute has pursued the latter course. It manufactures for its own use, and then sells to other schools a limited quantity of products, such as drawing boards, workbenches, drawing tables, cabinets, samples of wood, mitered table legs, and cases for unfinished work. It also does occasional special jobs by contract, when they are needed to keep up a sufficient supply and the requisite variety of work.

In order to handle all this work in an intelligent and businesslike way a cost system was adopted. Before adopting this, however, several systems were studied, and finally a very simple one was decided upon. The blanks used are, first, the shop order sheet, Fig. 4, which is made out in the business office of the Department of Manual Arts and forwarded with the drawing or other specifications to the teacher in charge of the factory shop. These order forms in duplicate are made up in books. The original is on a white sheet; the carbon duplicate is on a pink sheet and remains in the order book as an office record.

When the job is completed the teacher sends to the office a cost sheet, Fig. 5. The order number corresponds with the number on the shop order

SHOP ORDER NO._____

Date of Issue_____

To_____Department,

Under the Supervision of_____

Have the following work done, and a memorandum of cost (time and materials in separate items) sent to this office.

It should be completed_____

Signed_____

BRADLEY POLYTECHNIC INSTITUTE DEPARTMENT OF MANUAL ARTS

SHOP ORDER SHEET.

Fig. 4

SHOP ORDER NO._____

FOR_____

LABOR:		
Class A,_____Hours_____		
" B,_____ " _____		
" C,_____ " _____		
" D,_____ " _____		
" E,_____ " _____		
" F,_____ " _____		
" G,_____ " _____		
" H,_____ " _____		
MATERIALS:		
_____		
_____		
_____		
_____		
_____		
_____		
_____		
_____		
OFFICE: _____		
TOTAL_____		

Date of Report _____

Made by _____

BRADLEY POLYTECHNIC INSTITUTE. DEPARTMENT OF MANUAL ARTS

COST SHEET.

Fig. 5

sheet. The labor is classified strictly according to commercial value, or as near to that as the teacher can estimate. Class A represents an expert workman, usually the teacher, working at a machine. Class B represents an expert workman working at the bench. Class C represents a good workman—

ORDER	WORKMAN	DATE
START	FINISH	TIME
	WORK	

Fig. 6. Time Slip

one of the strongest students—and a machine; Class D represents a good workman at the bench. And so the labor is graded down to G and H, which stand for work of the "helper" grade. Each of these grades has a corresponding money value, which is used in completing each labor item on the sheet after it has been sent to the office. Materials are reported in similar detail. These items added, together with any extra office charge, give the total cost of the job. As in many modern factories, these cost items are figured so as to permit of the usual trade discounts.

The time slip used is shown in Fig. 6. This is printed, four on a sheet, with perforations between each. It is essentially a copy of a time slip which has been in successful use for many years

in certain woodworking factories in New England. The workman makes out a separate slip for each order worked on during the day, and therefore hands in as many slips each day as there are jobs worked on. The teacher on receiving them merely sees that the total is correct for the day and marks the classification on each slip as C, F, etc. Then he tears the slips apart, if still fastened together, and hangs them on hooks for the purpose, one hook for each order, or he groups them in a drawer or box, as seems to him to be convenient. When the job is done he summarizes the slips and puts the totals on the cost sheet, Fig. 5. This sheet is made in duplicate as was the case with the shop order sheets, so that a carbon copy is kept by the teacher. In this case, however, the original is a yellow sheet and the duplicate a white one. The colors add to the convenience in handling, especially in the Department office. When the system was first started, material slips similar to the time slips were used, but now stock bills made out by the workmen or a sub-foreman or by the teacher, as the case may be, are substituted for these slips in keeping a record of the material for a given job.

The cost sheets in the Department office serve in making out bills, in making financial statements of the shopwork, and in estimating future jobs.

The first shop order issued under this system was on Jan. 16, 1912. Between that date and

Sept. 1, 1912, work was completed to the value of about $800. The reports for the next three years give the following figures:

Year ending Sept. 1, 1913..$1,595.11
Year ending Sept. 1, 1914.. 2,052.81
Year ending Sept. 1, 1915.. 1,475.11

In making up the above figures a discount was taken off of all items not sold for cash, so that the figures are well within the actual value. Among the products sold for cash were drawing tables for a local public school, rural school benches, playground slide and teeter-totter for a children's home, a variety of furniture, drawing boards, study tables, bench-hooks, bread rack for a bakery, case of small drawers, stock for school use, etc. For the use of other departments of the Institute there were made a spring board, trestles, bleachers, etc., for the gymnasium; benches and table for the horology school; and tables, bookcases, and chart cases for several other departments. For the Manual Arts Department there has been made a large volume of work, including individual lockers for drawing room, drawing tables, interlocking drawing board cabinets, coat lockers, exhibit frames, foundry equipment, work-benches, tool cabinets, tables, furniture, drawing boards, T-squares, wood pulleys, and many more.

The man employed as teacher in the factory shop had taught very little before taking charge of

this shop, but during thirteen years of practical experience he had come in contact with the real problems of carpentry and millwork and pattern making. He therefore approached the problem from the vocation, and not from the school standpoint. During the first year he was working under the supervision of a man with many years of experience in teaching manual training classes in woodworking. The aim of both men was, first, to organize a real producing factory, admitting a comparatively few students, and then, little by little, to solve the problems of giving instruction as they came along in the natural order of development. It took comparatively little time to establish the factory routine, but it has taken much more time to determine the most effective organization of subject-matter and the best methods of giving instruction. In making decisions it has been necessary to keep two facts constantly in mind: First, that the aim of the shop is to teach and not to make money; and, second, that the factory routine and factory methods of doing work are an essential part of the educational scheme and must therefore be retained. The big problem, then, has been to harmonize the educational aim, namely, to produce intelligent, thoroly trained workmen, and the factory routine, which is intended to produce high-grade manufactured products at a speed that is acceptable in a commercial factory.

After three and one-half years of experimenting, the scheme of training, or the course of instruction, may be outlined as follows:

Group A. Before any student is allowed to use the machines of the shop, or any one machine, a series of demonstrations is given to acquaint the members of the class with the construction and operation of the machines. Minute instruction concerning the positions to be taken in working at each machine is given, and emphasis is placed on precautions to be taken in order to avoid accidents.

Group B. The first real experience at the machines is in getting out stock and such other rough work as will give experience in the use of the cut-off saw, the jointer, and the surfacer. The time spent in such work varies, with the student, from ten days, four hours a day, to two months, according to his ability. The average time is about six weeks. During this period it is expected that every student will be taught to measure lumber and identify a few of the common woods, both in the rough and surfaced.

Group C. As soon as the students have proven their reliability in the rough work they are taken off, one or two at a time, and started on the second type of work. This consists of making three or more joints from models given to the students. From the commercial factory standpoint this work is entirely non-productive, but experiments seem

to have proven conclusively that it is really a time saver and a lumber saver. It usually occupies from four to seven days and it prevents wasting many feet of lumber. The joints required of all are (a) a panel joint, (b) glass door joint, or rabbeted mortise-and-tenon joint, and (c) table leg joint. Others that are often added to this list are the sash joint, the table leaf joint (made later in the course when the student is allowed to use the shaper), the stretcher joint, etc. The joints are kept by the students for reference. The experience gained in this type of work seems to be of great value in thinking out the parts of a structure in their relation to each other, and it helps to develop an appreciation of the importance of accuracy in setting the machines.

Group D. The third type of work consists of small panel doors, glass doors, backs of cases and such other work of about the same grade of difficulty as may be available. Here, as elsewhere thruout the course, the students are promoted individually from one type of work to another, the basis of promotion being dependent on reliability in doing a thoro piece of work in a reasonable length of time, judged by the standard of the commercial factory. During this period each student makes a sketch of the piece he is making, and prepares a stock bill. This sketch is often made from a blueprint or drawing of the structure of which he is making a part. Often the problem involves

many duplicates, and two or more students work together on a job so as to do the work most efficiently. This type of work occupies about one month.

Group E. The fourth type of work occupies the remainder of the first year, and consists of construction and assembly work. This often requires one student to make a complete case from beginning to end, or the problems in hand may be such as to require that two or more students work together. Sometimes there are many duplicate parts to be worked, and sometimes there are but few. The student makes a sketch of each part of the structure he is making and puts the working dimensions on it. If a student has special ability he may be given charge of a complex job and subdivide it, thus laying out work for several students in different stages of skill. The assembling will later be done by the student who laid out the work, acting as a sub-foreman. During this period of work students get experience in wood-finishing and are given thoro instruction in the proper use of glue, and in the handling of gluing apparatus. They are taught the sharpening and use of the hand scraper; saw-filing is begun. They are also taught the economical use of lumber, which involves maintaining an organized system of caring for and utilizing scrap pieces. Scraps are classified, sometimes by sizes, sometimes by their use.

Group F. The fifth type of work is in many respects a continuation of the fourth, except that the work is done in harder and more valuable woods, requiring more accurate results. Such problems as an oak cabinet or the interior finish and casework for an office belong in this stage. It is in this stage that most of the students hope for an opportunity to act for a while as a subforeman. In this stage the most reliable students, and those only, are allowed to run the shaper. All students in this stage are required to make at least one wood pulley, and to get some experience in belting work and the elements of millwrighting. Special jobs involving templet work are included, circular-saw filing and band-saw filing and brazing are taught, and before the end of the course some problems in estimating are given. Thruout the entire two-year course there are occasional class demonstrations, lectures, and discussions, but in the work at the machines the students are assigned according to individual efficiency and held up to a commercial standard of accuracy, and approximately up to a commercial standard of speed when actually working at the machines.

The result of the three and one-half years of development is gratifying. While there are many things yet to be learned about the new problems involved in maintaining such a school factory on a sound educational and economic basis, enough

has been learned to state the following as conclusions:

(1) That school work in a factory shop must be organized with reference to teaching as well as with reference to producing. Such organization is necessary if instruction is to be efficient, and economical of the learner's time.

(2) The non-productive work has a place in the school factory shop—even exercise pieces pure and simple.

(3) That it is practicable, under favorable conditions, to operate a school shop under the factory system, but the factory system should not be allowed to prevent the instructor from stopping the work of any number of students at any time to give class or group instruction. The producing purpose of the factory shop must give way to the instruction purpose.

(4) That a school factory shop may be organized in such a way as to be a superior educational workshop, giving the most practical kind of instruction with a high degree of thoroness by methods that are sound pedagogically and that call forth a high type of interest on the part of students.

It seems to have been demonstrated that in the advanced stages of vocational training, after a good grounding in manual training work, experience in a producing factory is highly educative, provided a reasonable variety of work is done.

This has been proven in manufacturing establishments and in producing factories in schools, such as the one above. It seems also to have been demonstrated that in the earliest stages of shop instruction, whether that instruction be with strict vocational end in view or merely with a prevocational or a manual training end as the goal, experience in a producing factory is not as educative as experience under proper instruction in a school shop, tho certain school problems in duplicate production, both by hand and machine, are valuable in the school shop. As proof of the general statement it would seem necessary only to cite cases where factories have provided apprentice schools with special rooms for the beginners to learn the elements of handwork thru graded courses of lessons designed to give apprentices the fundamentals in the best way. The factories have found this way to be the cheapest in the long run.

Some figures gathered by Mark B. Hughes, of Detroit, for a report to the National Association of Corporation Schools are significant. To the question, "Do you believe manufacturers would be sufficiently benefited to warrant the expense of establishing apprenticeship or corporation schools?" 38 of the large corporations in the country, including 11 of the largest railroads and many great factories such as the General Electric Co., The Westinghouse Electric and Manufacturing Co., The Western Electric Co., Browne and Sharpe

Manufacturing Co., and R. R. Donnelly & Sons Co. answered "Yes." There was not a single "No" vote and only one voted with a question mark. To the question, "Do you favor a special mechanical instructor or allowing the shop foreman to do all the instructing?" Thirty answered in favor of the special instructor, 5 the shop foreman, and 2 both.

Anyone who has visited such a school as the one at the Lakeside Press in Chicago must be impressed with the fact that both the boy and the factory are profiting by separating the apprentices from the journeymen during the early stages of their apprenticeship and giving them work which is for the most part unproductive, except educationally. The factory training which follows this preliminary school is equally essential in making the finished workman.

CHAPTER VIII.

Three Typical Methods of Teaching the Manual Arts.

OUT of the experiences of the past thirty years of school instruction in the manual arts, there have come three more or less distinct and fundamental methods of teaching, namely, (1) the imitative method, (2) the discovery method, and (3) the inventive method.

Briefly stated the imitative method is as follows: Show the pupil how to do something by doing it in his presence. Explain to him every step in the process which he does not already know. Tell him why each step should be taken in a certain way. Explain any theory involved; answer his questions. Then tell him to do it himself. This method is the method of demonstration; it is deductive. It applies equally well to both class and individual instruction.

In sharp contrast with the imitative is the discovery method. In this the teacher shows the pupil the completed thing he is expected to make, but not the process of making it. He gives him the tools but does not show him how to use them. No demonstration lessons are given. Instead, he asks him to tell how he proposes to use the tools, and by what process he expects to produce

the object. The teacher stimulates him to think. Exercising his curiosity and his resourcefulness, he is expected to discover, or rather, to re-discover the correct methods of using tools. The reasoning is largely inductive. The instruction is almost exclusively individual. In the imitative method the teacher tells or shows the pupil almost everything; in the discovery method the teacher tells or shows him nothing. The teacher's constant effort in the discovery method is to develop rational thinking and this, he believes, will lead to good technic. He assumes that there is a discoverable, rational best way to do everything.

The inventive method is different from both the imitative and the discovery methods in that it begins, not with something planned ready to make and materials all selected, but with a conscious need for something to serve a known purpose and a desire to make something to supply that need. The procedure by this method is, first, to know definitely the conditions to be met by the thing to be made, second, to invent or design the thing to fulfill the conditions, third, to select materials and make the thing designed. From beginning to end the mind is centered on the thing being made and whether it will serve its purpose; the process of producing the thing, which in both the imitative and the discovery methods is given greatest emphasis, is here given secondary consideration. The instruction is largely individual, tho the

problem may be presented and discussed in class. It consists in supplying ideas from which the pupil may choose; it stimulates original thinking by questioning, by criticism, and by the statement and exposition of laws and principles.

I—The Imitative Method.

Imitation is instinctive, and the teacher who does not utilize this natural force fails to avail himself of one of his strongest allies. Writers on psychology have made this clear. Professor Bagley says, "It seems to be a fundamental law of psycho-physics that an idea or a perception always tends to work itself out in action; the child's concrete experience of witnessing a given process is applied instinctively in repetition of that process." [1] Professor Thorndike points out that one of the chief dangers in teaching the doing of things is neglect of imitation. He says: "Young children rarely, if ever, learn well such things as how to hold a pen or to cut or to sew by being told how; they have to be shown how." [2] This is in accord with the experience of every teacher of handwork; he knows that the easiest and quickest way to get a boy to hold and use a tool correctly is to show him how to do it. Often it is not necessary to speak a word; to do the thing in his presence is

[1]Bagley: *The Educative Process*, page 239.
[2]Thorndike: *The Principles of Teaching*, page 221.

sufficient. Again, Professor Bagley says, "The process of habit forming, once started by imitation, goes on by what may be called the method of trial and error. * * * All school activities that we group under the head of manual training (including writing, drawing, sloyd, etc.) and moral training (cleanliness, industry, silence, etc.) are important from this point of view. Here the aim is to train the muscles to certain specific adjustments, and the only way in which this can be done is by imitation, trial and error, and persistent practice. The task of the teacher is to provide a good model in the first place, and then to keep the child constantly returning to the process, frequently comparing the results of his work with the model, until proficiency results."[1] If we can accept this as fact, then the imitative method is fundamental in all manual arts teaching.

In this connection, however, it may be noted that imitation, being an instinct, does not need development; it needs to be utilized or transformed or even eliminated, for only the desirable, the good should be imitated; the undesirable and bad should be eliminated, and imitation should be held in check in this direction. The child imitates what he admires, and so the teacher's opportunity lies in the direction of helping the child to admire skill and good proportions and fine finish and graceful curves and all the other good qualities that are essential to fine craftsmanship.

[1]Bagley: *The Educative Process*, page 243.

II—The Discovery Method.

The discovery method is often spoken of as the heuristic method. This word "heuristic" comes from a Greek word which means to "find out." According to Professor De Garmo this method involves (a) the discovery of the essential facts of a lesson and (b) the cause of a phenomenon or the law governing it. In this method the teacher surrounds the child with apparatus and atmosphere favorable to certain discoveries and expects him to make the discovery. In its application to the teaching of the manual arts this method has found its most ardent advocate in Charles Bird, Supervisor of Manual Training in Leicester, England. With him it is largely a reaction against the machine-like method of extreme imitative teaching which leads to automatic action but fails to develop the thought power. In discussing his method Mr. Bird says:

"It will hardly be denied that the normal child possesses in a marked degree such characteristics as curiosity, inquisitiveness, a love of prying into things, of questioning and doubting, which are frequently amusing and sometimes embarrassing. Of his originality, adaptability, resourcefulness, and independence there can be no possible doubt. It is these characteristics, so pre-eminent in their importance as assets in after life, which a reasonable system of educational handwork can stimu-

late and strengthen. It is greatly to be feared these characteristics have not been strengthened but rather weakened by the educational method of the past.

"For this purpose the children must be allowed to depend upon their own thought and judgment in doing things. If the work given be interesting in character, and not too difficult for mind and hand to fashion, surely the children may be allowed to exercise their whole powers upon it without let or hindrance; the cause is discoverable, and it is the business of the teacher to see that the children discover it. Let the children see, think, and do; later may possibly be time for explanation, surely not before. * * *

"There is a discoverable reason why one method is better than another, if it be better; one tool more adapted to the purpose in hand than another, etc. If we wish the children to develop a reasonable judgment in all things, as we surely do, we must on no account discover for them what they can discover for themselves. And what can they not discover?

"Uniformity of method—in other words, the teacher's method—is not even desirable. What is wanted is that each child find its own method. If the children reveal themselves, the teacher can act from sure knowledge of strengths and weaknesses, of needs and necessities. Otherwise, if the teacher supplies the method, the children are

robbed of their natural inquisitiveness and curiosity, and may become mere storehouses of dead information. A little patience and a cheerful manner are all that are required to bring out the innate courage and capacity of the children, and cause them to attack their work with an intelligence, a vim, and a vigor delightful to observe."

In seeking to avoid the weaknesses of the imitative method the discovery method almost ignores a fundamental principle of habit formation, which is intended to avoid the formation of bad habits that must later be inhibited if good habits are to control. The study of a class at work under this system is sufficient to convince one that it emphasizes individual differences in children unduly. The pupils who come to the class prepared to think logically go ahead rapidly, while those who have not that preparation and need the more fundamental imitative basis for their work go very slowly. As a matter of fact, such pupils do imitate instead of think out the process. They have to; they have no power to do otherwise. If they are not allowed to imitate the correct method of the teacher they will imitate the incorrect method of the nearest fellow student, or if opportunity presents itself, of the student whom they know to be one of the best workmen in the class. The imitation will take place whether the teacher wants it to or not. In this respect the discovery theory cannot be strictly carried out in practice

unless pupils are isolated. Moreover, it has a tendency to discourage the pupil who has not developed sufficient reasoning power. With all such students it is uneconomical of time and effort both on the part of the pupil and the teacher. On the other hand it does have certain advantages, which have been pointed out by Mr. Bird.

III.—THE INVENTIVE METHOD.

From the standpoint of ultimate results the inventive method stands higher than the imitative because an inventor is regarded as more valuable to society than a mere imitator. On the other hand, society has need for many more routine skilled workers than inventors. In our present industrial organization most men must follow instructions; they must read a blueprint and produce work to given dimensions; they must do as they are told. Otherwise their product does not fit into the general scheme of production. Each workman's piece must take just the place intended in the mechanism or his labor is of no value. Cooperation, then, in industrial work, which is the fundamental method of the factory system, must be secured, and this means that hundreds of thousands of workers must carry out the plan of one man who is the inventor or designer. Thousands of parts—even millions—must be

made from one design. The power to read a blueprint is needed by a thousand workers, where the power to design a piece of mechanism is needed by only one. The public school must not omit the fundamental preparation for the man who must take industrial orders, and obey. On the other hand to stop with training to obey orders is to fall short of training for American citizenship. While the worker must have the ability to follow directions he must also, within his personal limitations, have the power of initiative. He should have power to think and the skill to do things outside of the limitations of a routine job—even a job requiring skill.

The inventive method places the worker in a relation to his work that is entirely different from that in the imitative method. It places him in the position of a master, of a person with authority and power to control. If a student is working from a blueprint or other working drawing given him by the teacher, he is expected to follow the drawing exactly in material and form and dimensions. On the contrary, if he has designed or invented the piece he is making, he is the guiding force in the work; he can change material or form or dimension. His own ideas are to be carried out, not those of some other man, except, of course, as he takes advice from the teacher. In this method, then, the teacher is more an inspirer, a counselor, than a boss who makes demands.

SUMMARY.

Comparing the three methods, the imitative is the most elementary. It prepares for industry; it is economical. The discovery method is good in certain places, or in modified form, to follow the imitative. Alone, or as a beginning method, it is industrially weak. With the imitative as a foundation it is good; it helps to make foremen and superintendents. The inventive method, also, is valuable after the imitative. It may produce inventors, designers, architects. It is sure to produce initiators instead of followers and mere obedient servants. Its chief weakness is that it may and often does ignore standards of construction and of technic. If the schools are to produce American citizens with (a) skill, (b) initiative and (c) power to think for themselves—those who can follow directions efficiently or can invent a better way, all three of these methods must be employed in teaching the manual arts in the schools.

QUESTIONS

CHAPTER I

These questions, based on the text of this book, are intended for the use of students, members of reading circles and individual readers. Teachers, also, will find them convenient.

1. In Colonial times was the motive for teaching the three R's a cultural one or a vocational one?
2. What led to the establishment of schools of science and engineering?
3. What is demanding a more widespread industrial intelligence today?
4. What manual arts should be taught in the schools?
5. What is the chief function of that section of the manual arts which is called the graphic arts?
6. Indicate the social significance of each of the following groups of constructive arts: (a) mechanic arts; (b) plastic arts; (c) textile arts; (d) book-making arts.
7. Show how the teaching of the manual arts in the schools is in harmony with the fundamental aim of education.

CHAPTER II

8. Compare the educational duality of function in the natural sciences and the manual arts.
9. To what great end in education may instruction in the manual arts effectively contribute?
10. In what special way do the manual arts contribute to the educative process, and why is this important?

11. What school of educational thought has emphasized the value of handwork as a method in teaching? What school the value of handwork as a subject?
12. Why should present-day work in the manual arts be regarded as both subject and method?
13. What should be the leading characteristics of the manual arts in (a) the primary grades, (b) the grammar grades, (c) the high school?

CHAPTER III

14. What is the difference between knowing a product of art and craftsmanship and knowing about it? Which is the proper basis for appreciation? Give illustrations.
15. What three elements are involved in the development of real appreciation of products of art and craftsmanship?
16. If the development of appreciation is one of the aims of teaching the manual arts in public schools, what do the above-mentioned three elements suggest concerning manual arts instruction and methods of teaching?

CHAPTER IV

17. To what extent is a nation, a state, or a city justified in spending money for public education?
18. What evidences are there that Americans do not yet properly estimate the economic value of education?
19. Show how that increasing vocational training need not decrease cultural training.
20. Give a specific example of a nation accomplishing a great economic purpose thru vocational training.

CHAPTER V

21. What is the chief difference between a good manual training course in a given craft or trade—machinist's, for example—and a vocational training course in the same craft or trade?
22. Name three fundamental considerations in selecting subject-matter for courses in manual arts, whether for vocational or general educational ends.
23. In what two major groups of occupations are found the majority of the male population of the United States of America?
24. What is meant by group analysis of an occupation, craft or trade?
25. What evidence may be gained from the development of the modern corporation school concerning the best way to organize instruction for purposes of vocational training?

CHAPTER VI

26. What serious fundamental difficulties in teaching shop-work called forth the group method of arranging the subject-matter of a course of instruction? Give specific examples of some of these difficulties.
27. What are the essentials of the group method?
28. How does the group method solve many problems arising because of the individual differences among pupils?

CHAPTER VII

29. What is the essential difference between a successful productive factory school and a commercial factory?
30. Why are some large commercial factories teaching their apprentices in non-productive shops?

31. Give briefly the essential facts concerning the productive factory woodworking shop at Bradley Institute: (1) equipment, (2) cost system, (3) results in manufactured products, (4) organization of subject-matter, (5) conclusions.

CHAPTER VIII

32. What three fundamental methods of teaching the manual arts have developed during the past thirty years? Describe each.
33. Why is the use of the imitative method alone undesirable? Why the discovery alone? Why the inventive alone?
34. Why should all three methods be employed in teaching the manual arts in public schools?
35. Discuss each of these three methods briefly with reference to (a) teaching technic, (b) habit formation, (c) developing power to think, (d) individual differences in pupils, (e) power of the pupil to do things that he has not been directly taught to do, (f) economy in learning.

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